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(54) Title: AQUEOUS COMPOSITION, AND THE USE OF A WETTING-IMPROVING AGENT

(57) Abstract

An aqueous composition, which contains a low-foaming alkyl glycoside of the formula (I): ROG_x , wherein R is a branched alkyl group having 6-12 carbon atoms, G is a monosaccharide residue, and x is a number in the range of 1-5, has, when combined with a low-foaming amphoteric compound and/or a low-foaming nonionic alkoxilate, proved to have a surprisingly good wetting effect. In addition to the surfactant composition, the aqueous composition may contain active substances, such as pesticides, herbicides, fertilisers, cleaning surfactants and alkaline agents.

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AQUEOUS COMPOSITION, AND THE USE OF A WETTING-IMPROVING AGENT

5 The present invention relates to an aqueous composition which, when applied to a surface, improves the wetting. As wetting-improving agent, the composition contains an alkyl glycoside, which is soluble in the aqueous composition and in which the alkyl group is a branched alkyl chain having 6-12 carbon atoms, in combination with a low-foaming amphoteric compound, which is soluble in the aqueous composition, or a nonionic alkoxilate, which is soluble in the aqueous composition, or a mixture thereof.

10 Surfactants are generally used for spreading an aqueous composition containing one or more active substances rapidly and evenly over a surface. As a result, the active substances in the composition are put to more efficient use.

15 Thus, the wetting properties of alkyl polyglycosides are known from Statutory Invention H 303 and US 4,888,325. Further, EP 220 902 proposes that also a foam inhibitor, such as dimethylpolysiloxane, be added to compositions containing alkyl glycoside as wetting agent. Likewise, EP-A-526 443 and WO 93/22917 state that alkyl polyglycosides used as wetting agents may be mixed with respectively an acetylene diol and a fatty alcohol as foam-inhibiting and wetting-improving agent. Since the foam inhibitors proposed have low water solubility, their presence may result in unstable formulations necessitating the addition of a solubiliser. Furthermore, unstable formulations or formulations to which a solubiliser has been added may result in an unacceptably high degree of foaming. Low-molecular solubilisers and foam inhibitors, such as low-molecular alcohols, may also create problems with unpleasant smells.

5 One object of the present invention is, therefore, to provide a wetting agent of good wetting power not necessitating any extra additions of a foam inhibitor of limited solubility

or of a solubiliser.

According to the invention, it has now proved possible to achieve this object and improve the wetting of a surface by using an aqueous composition which, as wetting agent, contains an alkyl glycoside which is soluble in the aqueous composition and has the formula



(I)

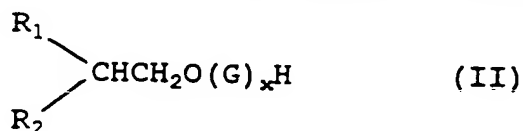
wherein R is a branched alkyl group having 6-12 carbon atoms, G is a monosaccharide residue, x is a number in the range of 1-5, and has a foaming not exceeding 25 mm after 5 min at 50°C, as measured according to Ross-Miles, and a concentration of 0.05% by weight, in combination with an amphoteric compound which is soluble in the aqueous composition and contains an alkyl group having 6-12 carbon atoms, and/or a nonionic alkoxilate which is soluble in the aqueous composition and contains an alkyl group having 6-12 carbon atoms, or a mixture thereof, the amphoteric compound and the alkoxilate having a foaming not exceeding 25 mm after 5 min at 50°C, as measured according to Ross-Miles, and a content of 0.05% by weight. The branched alkyl glycosides indicated above have a low tendency towards foaming and result, in combination with the lowfoaming amphoteric or nonionic surfactants indicated above, in excellent wetting properties. The amphoteric surfactant or the nonionic alkoxilate has been found to enhance the wetting power of the alkyl glycoside while keeping foaming at a low level.

The aqueous composition may advantageously be applied e.g. to hydrophobic surfaces, such as those of plant leaves, lacquered metal sheets, plastics, for instance polyethylene or PVC, and glass, as well as surfaces coated with hydrophobic dirt.

The weight ratio of the alkyl glycoside, on the one hand, to the amphoteric compound and/or the alkoxilate, on the other hand, usually ranges from 100:1 to 2:1, preferably from

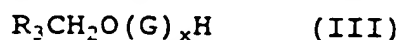
50:1 to 6:1. In a ready-to-use composition, the total content of all three components may vary within wide limits depending on the field of application, but it normally constitutes 0.1-4% by weight, preferably 0.2-2% by weight. If the composition is in the form of a concentrate that is ready for use after being diluted with water, the content of these three components usually is 2-80% by weight.

The alkyl glycoside of formula I preferably consists of compounds having the general formula



wherein R_1 is an alkyl group having 2-5 carbon atoms, preferably an alkyl group having 2-4 carbon atoms, R_2 is an alkyl group having 3-7 carbon atoms, preferably an alkyl group having 4-6 carbon atoms, the sum of carbon atoms in R_1 and R_2 being 5-12, preferably 6-10, G is a monosaccharide residue, and x is a number in the range of 1-5, preferably 1-4. This alkyl glycoside has good cleaning and wetting properties, as well as low foaming in relation to other straight alkyl glycosides of approximately the same chain length. Especially preferred compounds of formula II are those in which R_1 is 3, R_2 is 5, and G is a glucose residue. The glucosides have a neutral smell, are easily degraded and have low biotoxicity. In tests, one has not found any skin irritations caused by the alkyl glycosides. SE-A-9300955-3 discloses alkyl glycosides of this type.

Another preferred type of alkyl glycosides are those encompassed by the formula

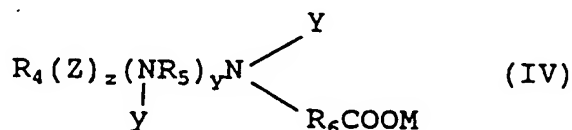


wherein R_3 is an alkyl group having a total of 6-12 carbon atoms and containing 1-4 groups of the formula $-CH(CH_3)-$ forming part of the carbon chain of the alkyl group, G is a monosaccharide residue, and x is a number in the range of 1-5, preferably 1-4. Preferably, the number of methyl groups is 2 or

3. Alkyl glycosides of formula III not only have good cleaning and wetting properties but also exhibit low foaming in relation to glycosides based on straight alcohols having approximately the same chain length. The alkyl glycosides of formula III are easily degraded and have low biotoxicity. In tests, one has not found any skin irritations caused by these alkyl glycosides. Especially preferred compounds are those in which R_3 contains 7-11 carbon atoms, since these compounds have a low tendency towards foaming and are relatively easy to produce.

SE-A-9300954-6 discloses alkyl glycosides of this type.

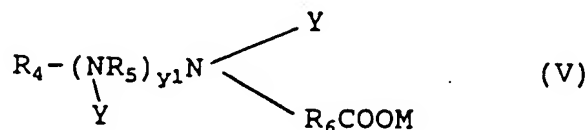
Conveniently, the amphoteric surfactant has the general formula



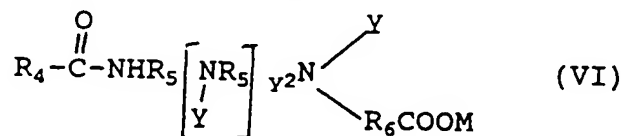
wherein R_4 is an alkyl group having 6-12 carbon atoms, Z is the group CO , a group $(B)_nOCH_2CH(OH)CH_2$, in which B is an oxyalkyl group having 2-4 carbon atoms, and n is a number in the range of 0-5, or the group $CH(OH)CH_2$, z is 0 or 1, R_5 is the group $-C_2H_4-$ or the group $-C_3H_6-$, y is a group R_6COOM , y is a number in the range of 0-3, y being 1-3 when z is 1 and Z is the group CO , R_6 is $-CH_2-$ or $-C_2H_4-$, and M is hydrogen or a cation. In addition, the amphoteric compound of formula IV has a surprisingly good solubilising power enabling the preparation of a concentrated aqueous composition.

Amphoteric compounds in which the number of R_6COOM groups is at least 2 are preferred, M preferably being a monovalent cation, such as an alkali ion or an organic ammonium ion. The designation y preferably is a number in the range of 0-2. The hydrocarbon group R_4 preferably is an aliphatic group having 6-15 carbon atoms. Specific examples of suitable R_4 groups are hexyl, 2-ethylhexyl, capryl and decyl groups, as well as alkyl groups corresponding to those indicated for formulae I, II and III. Examples of suitable amphoteric com-

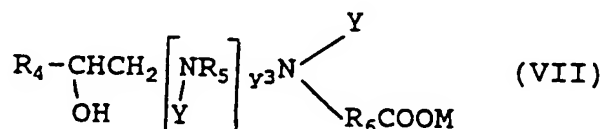
pounds are compounds having the formulae



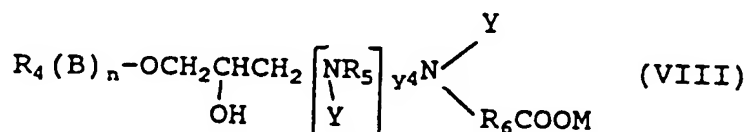
wherein R_4 , R_5 , R_6 , M and Y have the significations indicated for formula IV, and y_1 is a number in the range of 0-2, preferably 0 or 1, the number of R_6COOM groups being at least 2,



wherein R_4 , R_5 , R_6 , Y and M have the significations indicated for formula IV, and y_2 is 0 or 1, the number of R_6COOM groups being at least 2,

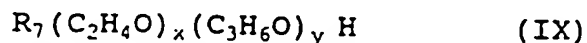


wherein R_4 , R_5 , R_6 , Y and M have the significations indicated for formula IV, and y_3 is a number in the range of 0-2, preferably 0 or 1, the number of R_6COOM groups being at least 2, and



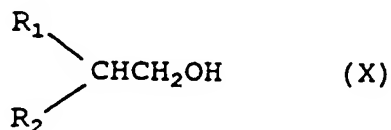
wherein R_4 , R_5 , R_6 , B , Y , M and n have the significations indicated for formula IV, and y_4 is a number in the range of 0-2, preferably 0 or 1, the number of R_6COOM groups being at least 2. Preferably, B is an oxyethylene group and n is 0 or 1.

Preferably, the nonionic alkoxilate consists of compounds having the formula



wherein R_7 is a branched or straight alkyl group having 6-13 carbon atoms, preferably 7-11 carbon atoms, x is a number in the range of 2-6, and y is a number in the range of 0-4, the groups C_2H_4O and C_3H_6O being randomly added or added in blocks.

Examples of alkyl groups are groups derived from straight alcohols or branched alcohols, such as oxoalcohols, alcohols having the formula



wherein R_1 and R_2 have the significations indicated for formula II, and methyl-substituted alcohols having the formula



wherein R_3 has the signification indicated for formula III.

In addition to the wetting-agent combination, the aqueous composition applied to a surface contains active substances, such as pesticides, herbicides, fertilisers, cleaning surfactants, and complexing agents, which may be present in solid state or in the form of emulsions, suspensions or solutions. Wetting-agent combinations according to the invention have proved to possess a good stabilising and solubilising power with respect to a great number of active substances. As a result, it has been found easy to formulate stable dispersions, emulsions and solutions having a high content of active substances. The wetting-agent composition is especially suited for use when the formulation consists of solutions and microemulsions having a high content of active substances.

Examples of formulations, in which compositions according to the invention may be used, are micronutrient solutions containing different micronutrients, such as iron, manganese, zinc, copper, boron and molybdenum, which are complexed, preferably to amino carboxylates, such as EDTA, DTPA, MEDTA and EDDHA. Apart from micronutrients, the formulation may advantageously contain macronutrients, such as potassium, nitrogen, phosphorus, magnesium and sulphur.

Other possible formulations are liquid detergents which, besides the alkyl glycoside indicated above, the amphoteric compound and/or the alkoxilate, may contain complexing agents,

preferably of amino carboxylate type, such as EDTA, DTPA, HEDTA, NTA and EDDHA, and optionally further surfactants, which may be anionic, nonionic, cationic, amphoteric and/or zwitter-
5 ionic. For instance, it has been found that the wetting-agent composition according to the invention is especially suited for use in detergents having a high content of alkaline agents, such as alkali hydroxides, complexing agents and silicates, and having a pH value above 11, preferably above 12. The wetting
10 agent according to the invention considerably improves the poor wetting power of these alkaline detergents, which indirectly improves the actual cleaning.

Example 1

15 **Test procedure.** A water drop (about 4 ml), which contained different wetting agents and optionally various active substances, such as cleaning surfactants, pesticides, herbicides and fertilisers, was applied to a paraffin-wax surface (Parafilm). The propagation (spreading) of the drop was measured by determining the contact angle after 2 s and 100 s.

The following results were obtained.

Example	Component	% by weight	Contact angle	
			2 s	100 s
A	2-ethylhexyl glucoside (x=1.6)	1	49	39
1	2-ethylhexyl glucoside (x=1.6)	0.95	40	29
	2-ethylhexyl iminodipropionate (z=0, y=0)	0.05		
2	2-ethylhexyl glucoside (x=1.6)	0.90	40	30
	2-ethylhexyl iminodipropionate (z=0, y=0)	0.1		
3	2-ethylhexyl glucoside (x=1.6)	0.95	39	30
	caprylamphopropionate (z=0, y=0)	0.05		
4	2-ethylhexyl glucoside (x=1.6)	0.95	34	28
	Undecanol + 3 EO	0.05		
5	2-ethylhexyl glucoside (x=1.6)	0.95	39	30
	2-hydroxydecyl iminopropionate (z=0, y=0)	0.05		
6	2-ethylhexyl glucoside (x=1.6)	0.95	39	28
	3-octoxy-2-hydroxypropyl iminodiacetate (z=0, y=0)	0.05		
B	Glyphosate, isopropylamine salt (herbicide)	0.8	97	90
C	Glyphosate, isopropylamine salt	0.8	47	35
	2-ethylhexyl glycoside (x=1.6)	1.0		

7	Glyphosate, isopropylamine salt	0.8	38	31
	2-ethylhexyl glucoside (x=1.6)	0.95		
	2-ethylhexyl iminodipropionate (z=0, y=0)	0.05		
8	Glyphosate, isopropylamine salt	0.8	41	32
	2-ethylhexyl glucoside (x=1.6)	0.95		
	3-octoxy-2-hydroxypropyl iminodiacetate (z=0, y=0)	0.05		
9	Glyphosate, isopropylamine salt	0.8	31	27
	2-ethylhexyl glucoside (x=1.6)	0.95		
	Undecanol + 3 EO	0.05		
D	Leaf fertiliser (NPKS type)	0.8	108	105
E	Leaf fertiliser (NPKS type)	0.8	49	37
	2-ethylhexyl glucoside (x=1.6)	0.5		
10	Leaf fertiliser (NPKS type)	0.8	40	33
	2-ethylhexyl glucoside (x=1.6)	0.475		
	2-ethylhexyl iminodipropionate (z=0, y=0)	0.025		
F	Fertiliser (NKS type)	0.8	90	81
H	Fertiliser (NKS type)	0.8	39	35
	2-ethylhexyl glucoside (x=1.6)	0.7		
11	Fertiliser (NKS type)	0.8	36	31
	2-ethylhexyl glucoside (x=1.6)	0.63		
	caprylamphopropionate (z=0, y=0)	0.07		
I	Fertiliser (K type)	0.8	68	61

K	Fertiliser (K type)	0.8	40	37
	2-ethylhexyl glucoside (x=1.6)	1.0		
12	Fertiliser (K type)	0.8	35	30
	2-ethylhexyl glucoside (x=1.6)	0.95		
	2-ethylhexyl iminodipropionate (z=0, y=0)	0.05		
L	2-propylheptyl glucoside (x=3.5)	0.35	45	31
13	2-propylheptyl glucoside (x=3.5)	0.325	42	29
	Undecanol + 3 EO	0.025		
M	2-propylheptyl glucoside (x=3.5)	0.50	35	26
14	2-propylheptyl glucoside (x=3.5)	0.475	33	23
	3-octoxy-2-hydroxypropyl iminodiacetate (z=0, y=0)	0.025		
15	Glyphosate	0.8	31	20
	2-propylheptyl glucoside (x=3.5)	0.475		
	3-octoxy-2-hydroxypropyl iminodiacetate (z=0, y=0)	0.025		

It is evident from these results that the spreading with the wetting-agent composition according to the invention is considerably improved, as compared with the case when only low-foaming alkyl glycosides are used.

Example 2

The foam height for the following components was measured according to Ross-Miles at a content of 0.05% by weight and at a temperature of 50°C, both at once and after 5 min. The following results were obtained.

Example	Component	Foam Height, mm	
		0 min	5 min
1	2-ethylhexyl glucoside (x=1.6)	8	0
2	2-ethylhexyl iminodipropionate (z=0, y=0)	5	0
3	caprylamphopropionate (z=0, y=0)	8	1
4	1 and 2 in a ratio of 95:5	6	0
5	1 and 3 in a ratio of 95:5	11	1
6	Undecanol + 3 EO	15	10
7	2-propylhexyl glucoside (x=3.5)	22	10
8	1 and 6 in a ratio of 95:5	25	15
9	7 and 6 in a ratio of 93:7	23	15
10	3-octoxy-2-hydroxypropyl imino-diacetate (z=0, y=0)	36	13
11	2-hydroxydecyl iminodipropionate (z=0, y=0)	5	0
12	1 and 10 in a ratio of 95:5	5	0
13	1 and 11 in a ratio of 95:5	7	0
14	7 and 10 in a ratio of 95:5	24	11
15	7 and 11 in a ratio of 95:5	32	16
A	Straight-chained C ₈₋₁₀ -alkyl glucoside (x=2)	60	60
B	Straight-chained C ₈₋₁₀ -alkyl glucoside (x=2) Straight-chained C ₈₋₁₀ -alcohol in a ratio of 95:5	59	56

5 It is evident from these results that the alkyl glycosides according to the invention exhibit much lower foaming than equivalent straight-chained alkyl glycosides. It is especially remarkable that the limited amount of foam formed when use is made of the alkyl glycosides according to the invention collapses fairly rapidly, whereas the alkyl glycoside in the comparative tests A and B gives rise to high-stability foam.

CLAIMS

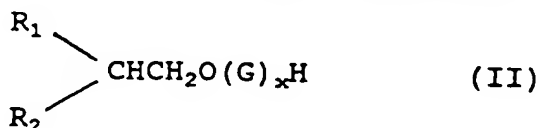
1. An aqueous composition containing an alkyl glycoside, an amphoteric compound and/or a nonionic alkoxilate, characterised in that the alkyl glycoside, which is soluble in the aqueous composition, has the formula



wherein R is a branched alkyl group having 6-12 carbon atoms, G is a monosaccharide residue, and x is a number in the range of 1-5, and has a foaming not exceeding 25 mm after 5 min at 50°C, as measured according to Ross-Miles, and a concentration of 0.05% by weight, and that the amphoteric compound and the alkoxilate, which are soluble in the aqueous composition, have an alkyl group containing 6-12 carbon atoms, a foaming not exceeding 25 mm after 5 min at 50°C, as measured according to Ross-Miles, and a content of 0.05% by weight.

2. A composition as set forth in claim 1, characterised in that the weight ratio of the alkyl glycoside to the amphoteric compound and the alkoxilate ranges from 100:1 to 2:1, preferably from 50:1 to 6:1.

3. A composition as set forth in claim 1 or 2, characterised in that the alkyl glycoside has the formula



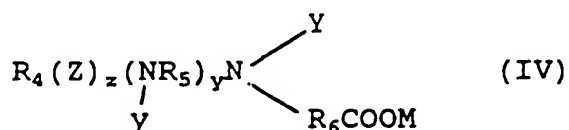
wherein R₁ is an alkyl group having 2-5 carbon atoms, preferably an alkyl group having 2-4 carbon atoms, R₂ is an alkyl group having 3-7 carbon atoms, preferably an alkyl group having 4-6 carbon atoms, the sum of carbon atoms in R₁ and R₂ being 5-12, preferably 6-10, G is a monosaccharide residue, and x is a number in the range of 1-5, preferably 1-4, or the formula



wherein R₃ is an alkyl group having a total of 6-12 carbon

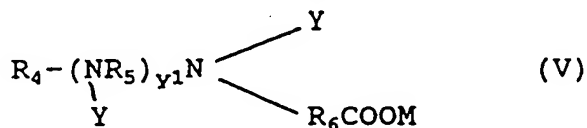
atoms and containing 1-4 groups of the formula $-\text{CH}(\text{CH}_3)-$ forming part of the carbon chain of the alkyl group, G is a monosaccharide residue, and x is a number in the range of 1-5, preferably 1-4, the number of methyl groups preferably being 2 or 3.

4. A composition as set forth in any one of claims 1-3, characterised in that the amphoteric compound has the formula

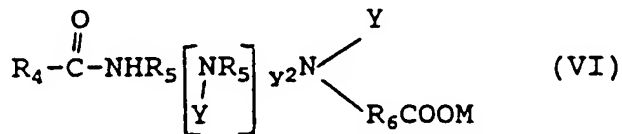


wherein R_4 is an alkyl group having 6-12 carbon atoms, Z is the group CO, a group $(\text{B})_n\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2$, wherein B is an oxyalkylene group having 2-4 carbon atoms, and n is a number in the range of 0-5, or the group $\text{CH}(\text{OH})\text{CH}_2$, z is 0 or 1, R_5 is the group $-\text{C}_2\text{H}_4-$ or the group $-\text{C}_3\text{H}_6-$, Y is a group R_6COOM , y is a number in the range of 0-3, y being 1-3 when z is 1 and Z is the group CO, R_6 is $-\text{CH}_2-$ or $-\text{C}_2\text{H}_4-$, and M is hydrogen or a cation.

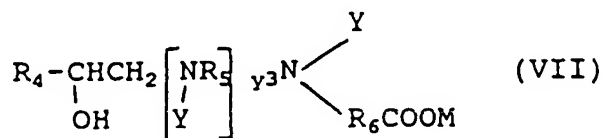
5. A composition as set forth in claim 4, characterised in that the amphoteric compound has one of the following formulae



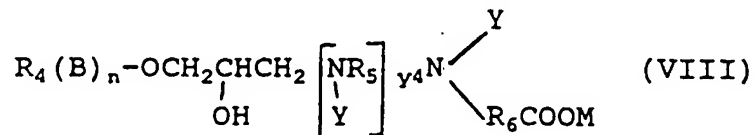
wherein R_4 , R_5 , R_6 , M and Y have the significations indicated for formula IV, and y_1 is a number in the range of 0-2, preferably 0 or 1, the number of R_6COOM groups being at least 2,



wherein R_4 , R_5 , R_6 , Y and M have the significations indicated for formula IV, and y_2 is 0 or 1, the number of R_6COOM groups being at least 2,

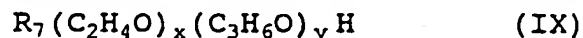


wherein R_4 , R_5 , R_6 , Y and M have the significations indicated for formula IV, and y_3 is a number in the range of 0-2, preferably 0 or 1, the number of $R_6\text{COOM}$ groups being at least 2, and



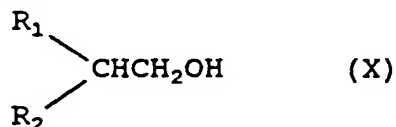
wherein R_4 , R_5 , R_6 , B , Y , M and n have the significations indicated for formula IV, and y_4 is a number in the range of 0-2, preferably 0 or 1, the number of $R_6\text{COOM}$ groups being at least 2, B preferably being an oxyethylene group, and n preferably being 0 or 1.

6. A composition as set forth in any one of claims 1-5, characterised in that the alkoxilate has the formula

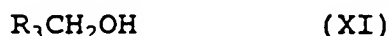


wherein R_7 is a branched or straight alkyl group having 6-13 carbon atoms, preferably 7-11 carbon atoms, x is a number in the range of 2-6, and y is a number in the range of 0-4, the groups $\text{C}_2\text{H}_4\text{O}$ and $\text{C}_3\text{H}_6\text{O}$ being randomly added or added in blocks.

7. A composition as set forth in claim 6, characterised in that the alkoxilate is derived from alcohols of the formula



wherein R_1 and R_2 have the significations indicated for formula II, or from alcohols of the formula



wherein R_3 has the signification indicated for formula III.

8. A composition as set forth in any one of claims 1-7, characterised in that it contains a pesticide, a herbicide or a fertiliser.

9. A composition as set forth in any one of claims 1-8, characterised in that, in addition to the alkyl glycoside described above, the amphoteric compound and the alkoxilate, it contains one or more alkaline agents and optionally further surfactants, which may be anionic, nonionic, cationic, amphoteric and/or zwitterionic.

10. The use of a combination of an alkyl glycoside, an amphoteric compound and/or an alkoxilate as set forth in any one of claims 1-6, as a wetting agent.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/96/00498

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C11D 1/66, A01N 25/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C11D, A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9504592 A1 (SOCIETE D'EXPLOITATION DE PRODUITS POUR LES INDUSTRIES CHIMIQUES, S.E.P.P.I.C.), 16 February 1995 (16.02.95), claims 1-2, abstract --	1
Y	WO 8809369 A1 (STALEY CONTINENTAL, INC.), 1 December 1988 (01.12.88), page 2, line 14 - line 17; page 8, line 18 - line 21; page 10, line 13 - line 27, page 13, line 29 - page 14, line 1 - line 2, abstract --	1-10
Y	WO 9421655 A1 (BEROL NOBEL AB), 29 Sept 1994 (29.09.94) --	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

& document member of the same patent family

Date of the actual completion of the international search

16 July 1996

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00498

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9421769 A1 (BEROL NOBEL AB), 29 Sept 1994 (29.09.94) --	1-10
A	WO 9320171 A1 (HENKEL KOMMANDITGESELLSCHAFT AUF AKTIEN), 14 October 1993 (14.10.93) -- -----	1-10